

REMARKS

Claims 1-28 will be pending upon entry of the present amendment. Claims 2-3 are amended. Claim 28 is new. No new matter is presented.

An embodiment of the invention is directed to an integrated circuit package in which resin flashes are securely retained on the integrated circuit lead frame after molding. In prior art packages, flashes are formed on the lead frame due to resin seeping out of an air vent during molding. In such prior art packages, the flashes do not cohere to the lead frame very well and thus become detached easily and cause a series problems in the manufacturing machinery and the integrated circuit package itself. The inventors discovered that such problems could be solved by placing a through-hole in the lead frame adjacent to the air vent. Such a through-hole receives a portion of the resin seeping out of the air vent and enables the resulting flash to cohere much more securely to the lead frame.

Claims 1-5, 7, and 16-26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,665,296 to Jain et al. ("Jain") in view of U.S. Patent No. 6,106,259 to Lee et al. ("Lee").

Jain and Lee do not teach or suggest the invention recited by claim 1. The Examiner admits that Jain does not disclose an air vent as recited by claim 1, but points to Izuma as supplying this missing element. Claim 1 recites a structure having a frame with a through hole placed adjacent to an outlet of an air vent of a mold. Lee teaches to fill a mold 20 via a runner 23 (Fig. 6A). An air vent 28 is located on an opposite side of the mold 100 with respect to the runner 23. Lee teaches no other holes, and thus, does not suggest a frame with a through hole placed adjacent to an outlet of an air vent. Accordingly, any combination of Jain and Izuma would result in a device with an air vent placed on a opposite side of a mold from Jain's mold hole 38, rather than a through hole placed adjacent to an outlet of the air vent. Accordingly, claim 1 is nonobvious in view of Jain and Lee.

Claims 2-5 and 7 depend on claim 1, and thus, are also allowable. In addition, Jain and Lee do not teach or suggest features recited in claims 2-5 and 7. For example, claim 2 recites that said through hole has an ellipsoidal shape having a center positioned on an axis of said air vent and has a minor diameter dimension shorter than a diameter of said air vent.

Although Jain mentions that shapes other than square can be used for the mold flow hole 38, Jain does not suggest that the hole 38 should have a minor diameter dimension shorter than a diameter of said air vent. Given that Jain does not show an air vent and neither Jain nor Lee discuss actual dimensions Jain's hole 38 or Lee's vent 28, Jain and Lee do not suggest the relative dimensions recited in claim 2. Moreover, Jain teaches away from using a hole with a dimension smaller than a diameter of an air vent by stating that the mold hole 38 should provide the least amount of fluid resistance, which implies a larger mold hole 38. Claims 4 and 7 depend on claim 2, and thus, incorporate the elements of claim 2.

Jain and Lee also do not teach or suggest the elements of claim 3. Claim 3 recites that said through hole has a circular section with a center positioned on an axis of said air vent and has a dimension of its diameter equal to or shorter than a diameter of said air vent. As discussed with respect to claim 2, Jain and Lee do not suggest that the mold hole 38 of Jain has a diameter equal to or shorter than the diameter of Lee's air vent 28. In fact, Jain teaches away from such relative dimensions as discussed above. Claim 5 depends on claim 3, and thus, incorporates the elements of claim 3.

For the foregoing reasons, claims 2-5 and 7 are in condition for allowance.

Although the language of claims 16-26 differs from that of claims 1-5 and 7, the allowability of claims 16-26 will be apparent in light of the above discussion.

Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Jain in view of Lee and Tsunoda et al., U.S. Patent 5,914,531 ("Tsunoda"). Jain, Lee, and Tsunoda do not teach or suggest the invention recited by claim 6. Claim 6 depends on claim 1. As discussed above, the combination of Jain and Lee would not result in the invention recited by claim 1. Tsunoda does not teach or suggest the features of claim 1 that are missing from Jain and Lee. In particular, Tsunoda does not suggest placing a frame through hole adjacent to a mold air vent. Accordingly, claim 6 is nonobvious in view of Jain, Lee, and Tsunoda.

Claims 8-12 and 27 are rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,635,220 to Izumi et al. ("Izumi") in view of Lee.

Izumi and Lee do not teach or suggest the invention recited in claim 8. Claim 8 recites an integrated circuit package that includes:

a molded portion having an injection area through which resin was injected to form the molded portion, a flashing portion of molded material extruded from a vent area of the molded portion, the vent area being spaced apart from the injection area; and

a lead-frame external to the molded portion and having a hole adjacent to the vent area of the molded portion, the flashing portion at least partially filling the hole.

Izumi and Lee do not teach or suggest a lead-frame with a hole adjacent to a vent area of a molded portion. Izumi is like Jain in that Izumi shows a lead frame 301 with an injection aperture 308 for injection of the resin into a mold 100. As discussed above, Lee shows an air vent 28 on an opposite side of the mold from the injection runner 23. Thus, if Izumi were modified to include Lee's air vent 28, the resulting structure would have an air vent 28 on an opposite side of the mold from, rather than adjacent to, the injection aperture 308. Therefore, Izumi and Lee do not suggest the claimed IC package in which the lead-frame has a hole adjacent to the vent area of the molded portion.

Izumi and Lee also do not suggest the portion of claim 8 reciting a flashing portion of molded material extruded from a vent area of the molded portion, the flashing portion at least partially filling the hole. As noted above, the air vent 28 of Lee is on an opposite side of the mold from the injection aperture 308 in the hypothetical Izumi/Lee combination. Thus, there is no way that a flashing portion of molded material extruded from the air vent 28 would partially fill the injection aperture 308.

For the foregoing reasons, claim 8 is nonobvious in view of Izumi and Lee. Claims 9-12 and 27 depend on claim 8, and thus, are also nonobvious in view of Izumi and Lee.

Claims 13-15 were rejected under 35 U.S.C. § 103 as being obvious over Izumi in view of Lee and Jain.

Izumi, Lee, and Jain do not teach or suggest the invention recited in claims 13-15, which depend on claim 8. As discussed above, Lee shows an air vent 28 on an opposite side of the mold from the injection area and Izumi and Jain both show injection apertures (308 in Izumi and 38 in Jain) in the injection area. Therefore, a hypothetical combination of Izumi, Lee, and Jain still would not suggest an air vent adjacent to a hole in a lead frame and would not suggest a

flashing portion of molded material extruded from the air vent 28 that would partially fill the injection aperture. Accordingly, claims 13-15 are nonobvious in view of Izumi, Lee, and Jain.

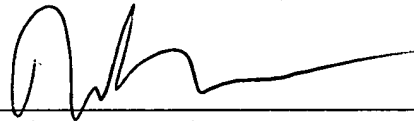
New claim 28 depends on claim 1, and thus, is nonobvious in view of the cited art.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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